

1) A drug administered to a patient is consumed by a first order reaction. The half-life of the process is 200. minutes. If a 40.0 mg dose is initially given, how much remains in the body after exactly 12 hours? ($a=1$)

2) $^{14}_6\text{C}$ is used to determine the age of carbon-containing artifacts ($a=1$). The half-life of this isotope is 5730 years. If 72.0% of the original isotope is present in one such artifact, how old is it?

3) The decomposition of a peroxide initiator for addition polymerization is second order in the peroxide. The reaction is $2 \text{BP} \rightarrow 4 \text{R}$. The rate constant for the reaction is $3.35 \times 10^4 \text{ M}^{-1}\text{sec}^{-1}$ at 353 K. The starting concentration of the BP is $1.00 \times 10^{-6} \text{ M}$. How much peroxide remains after exactly one minute?

4) The dimerization reaction to form a gene activator protein has a rate constant of $9.00 \times 10^8 \text{ M}^{-1}\text{sec}^{-1}$ at 37.0 °C. The process is $2 \text{IM} \rightarrow \text{GAP}$. If the initial monomer (IM) concentration is 10.0 nM, how long does it take for 50.0 % of the IM to dimerize?

5) Ethanol is metabolized in the bloodstream by a zero order process, ethanol \rightarrow ethanal, with a rate constant of $3.90 \times 10^{-3} \text{ M/hr}$ at 37.0 °C. If the initial concentration is 0.0174 M (0.08%), how long will it take to decrease the concentration to $4.35 \times 10^{-3} \text{ M}$?

1) 3.29 mg 2) 2710 years 3) $1.99 \times 10^{-7} \text{ M}$ 4) 0.0556 sec
5) 3.35 hr